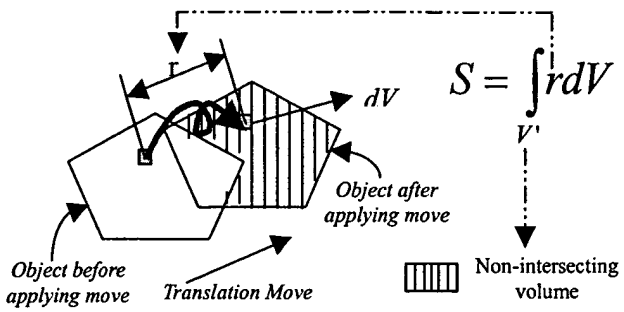

r
dV
$S = \int_{V'} r dV$
Object after applying move
Object before applying move
Translation Move
Non-intersecting volume

FIG. 1

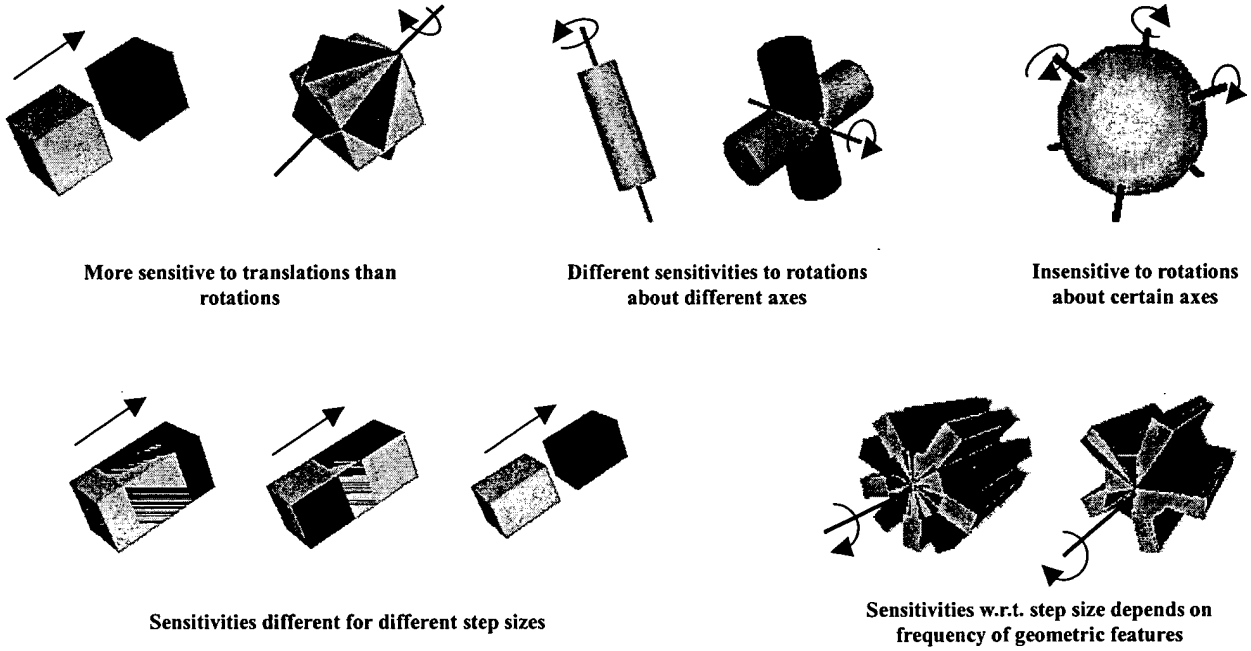

More sensitive to translations than rotations
Different sensitivities to rotations about different axes
Insensitive to rotations about certain axes
Sensitivities different for different step sizes
Sensitivities w.r.t. step size depends on frequency of geometric features

FIG. 2

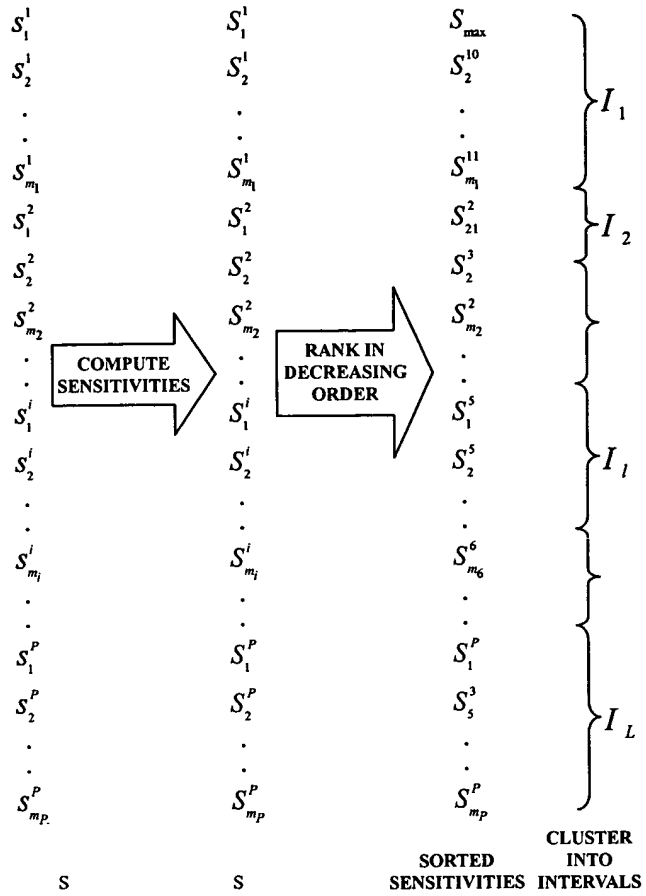



FIG. 4

1. The set S of all sensitivities $S_i^k$ of the moves $s_i^k$ is computed according to the Eq. (1);
2. $S_{max} = \arg\max(S_i^k)$; $S_{min} = \arg\min(S_i^k)$;
3. $u_1 = S_{max}$; $l_L = S_{min}$;
4. $lsb_l = \rho usb_l$; for $l = 1, 2, \ldots L-1$; $\rho = \left(\frac{S_{min}}{S_{max}}\right)^{\frac{1}{L}}$;
5. $usb_{l+1} = lsb_l$; $l = 1, 2, \ldots, L$ ;
6. The sensitivities $S_i^k$ are assigned to the appropriate intervals $I_l$ such that $l_l < S_i^k \le u_l$.

FIG. 3

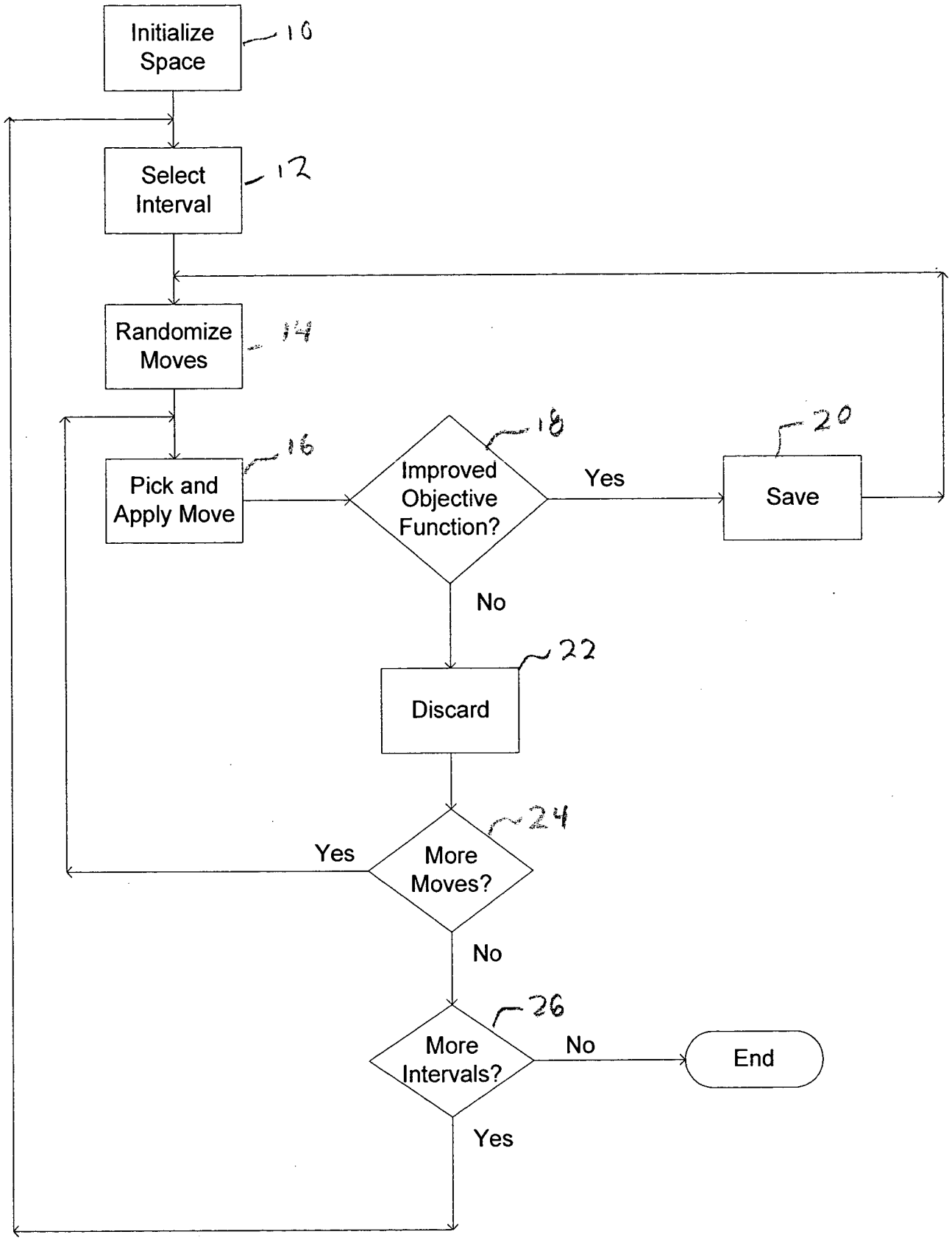

Initialize Space
10
Select Interval
12
Randomize Moves
14
Pick and Apply Move
16
Improved Objective Function?
18
Yes
Save
20
No
Discard
22
More Moves?
24
Yes
No
More Intervals?
26
No
End
Yes

FIG. 5

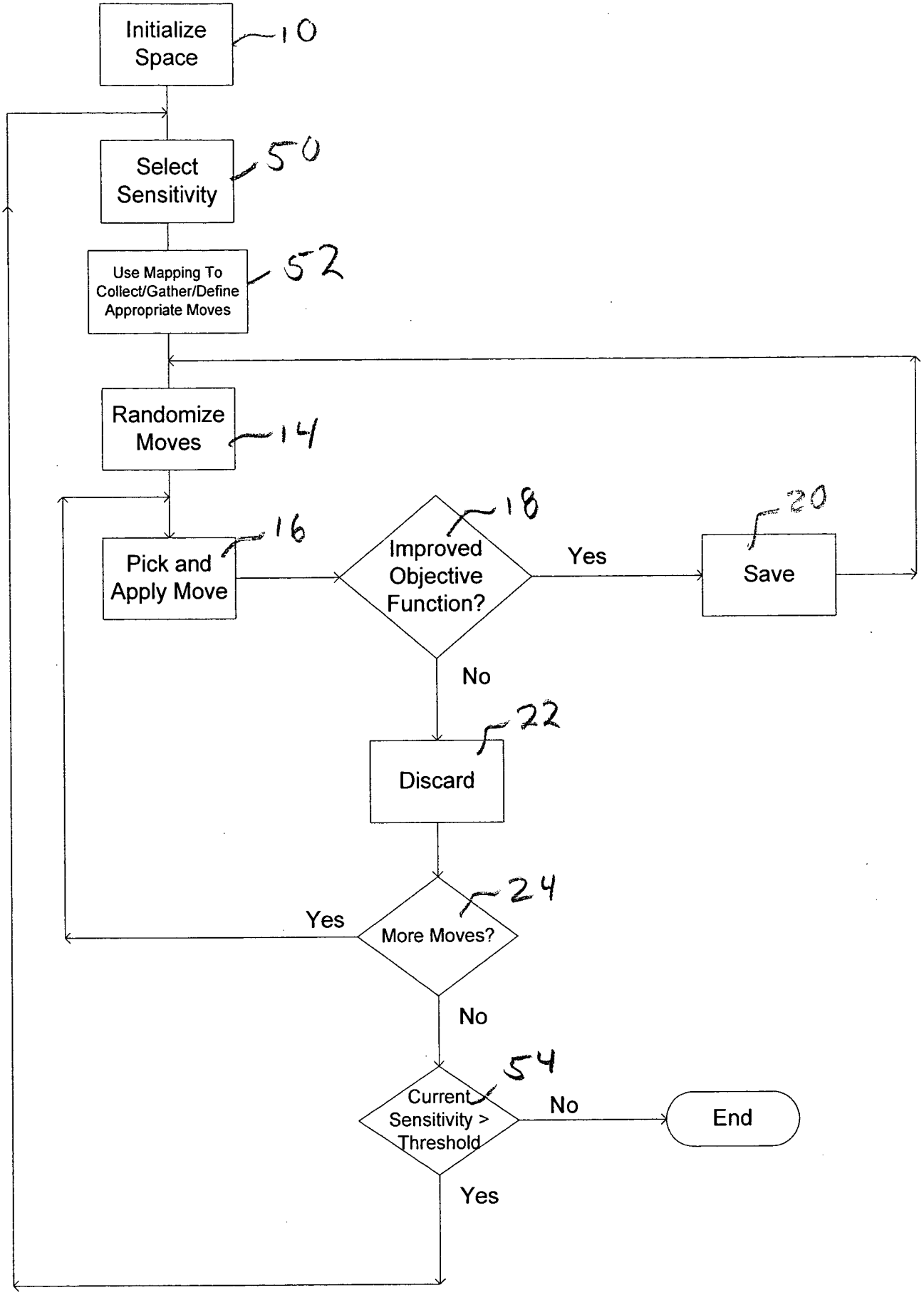
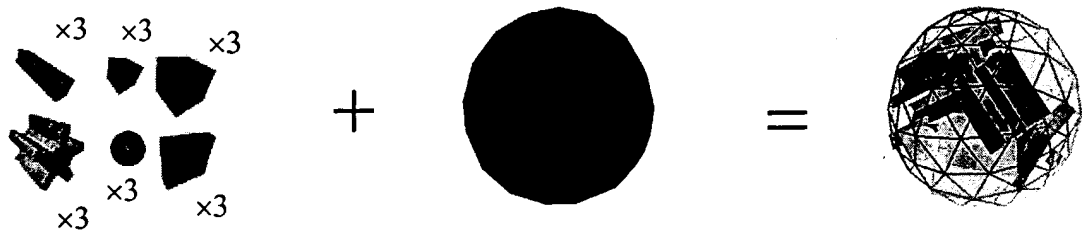

Initialize Space
10
Select Sensitivity
50
Use Mapping To Collect/Gather/Define Appropriate Moves
52
Randomize Moves
14
Pick and Apply Move
16
Improved Objective Function?
18
Yes
Save
20
No
Discard
22
More Moves?
24
Yes
No
Current Sensitivity > Threshold
54
No
End
Yes

FIG. 6



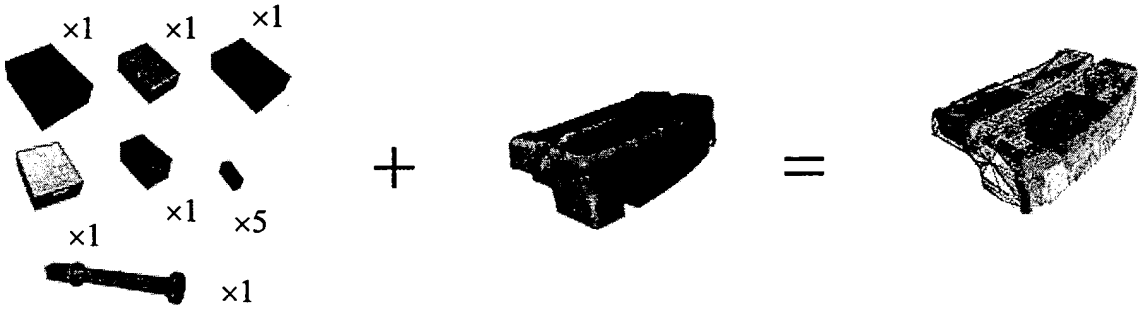

Components
Volume=343,196

Container
Volume=883,768

Packing

| # DOF | 99 |
|---|---|
| Packing density | 0.388 |

FIG. 7 (a) Mixed geometries in Sphere



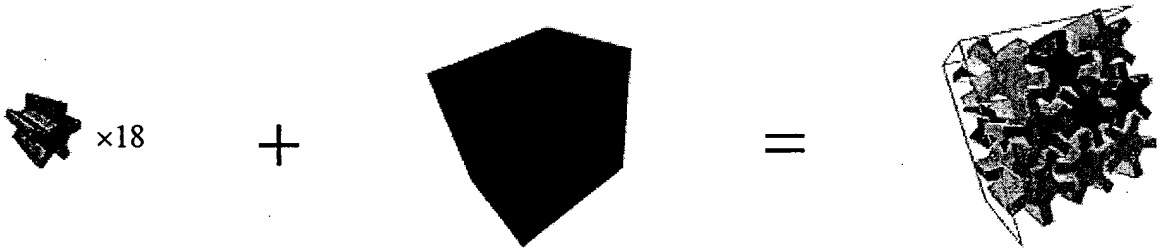

Components
Volume= 271,066

Container
Volume= 539,547

Packing

| # DOF | 33 |
|---|---|
| Packing density | 0.502 |

FIG. 7 (b) Automobile Trunk




Components
Volume=455,534

Container
Volume=882,000

Packing

| # DOF | 72 |
|---|---|
| Packing density | 0.516 |

FIG. 7 (c) Gears in Cuboid

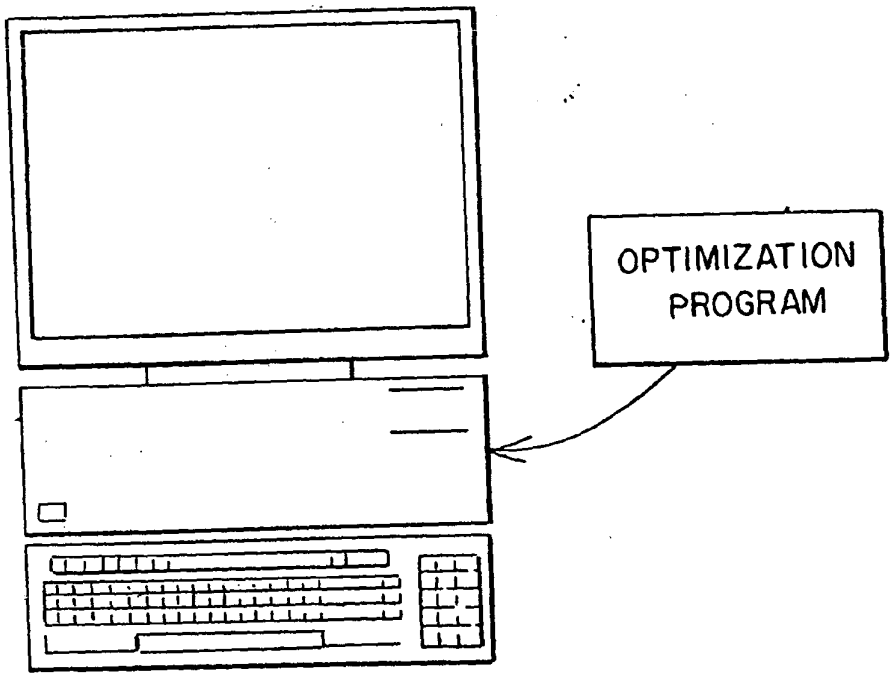



FIG. 8